Boiler Group Chair/Co-Chair

ICCR Boiler Source Work Group

Attached is a table entitled HAPs Selection and Test Methods for Digester gas Fired Boilers. The list contains the names of the 189 Hazardous Air Pollutants (HAPs) that have, based on experience, been screened for potential presence in emissions from digester gas fired boilers. This preliminary screening has been performed on the list by the Testing and Monitoring Protocol Work Group (TMPWG). This table is being forwarded to the Boiler Source Work Group (SWG) for review and comment.

The table includes HAPs that may be present in these emissions. Additionally, a listing of testing methods that have been used and have the potential to quantify the HAPs presence in flue gas emissions are included.

For those HAPs that are not included in the list, a codified reason for their exclusion is provided. Exclusion codes include:

1- Compound is not expected to be emitted from source because basic chemical or physical principles do not favor its existence in source exhaust.

2 - Existing test data indicate that compound is not emitted in significant quantities from source.

Other exclusion codes are included as appropriate.

It should be noted that this table is general in its first draft and represents the extent of the TMPWG's knowledge and experience with emissions from digester gas fired boilers. Please review carefully from a standpoint of those HAPs included as well as those HAPs excluded. The subgroup within the TMPWG that is responsible for the development of this table has included a preface that provides the sources of information utilized to develop the table, the rationale for exclusion codes, and the names of the TMPWG contact for the Boiler SWG.

If we can be of service in any other fashion or if you have any questions concerning in the table, please contact Tom McGrath (e-mail: "eertommc@hotmail.com") the TMPWG member who is monitoring the activities of your SWG.

Rationale for Compound Selection for Reduced Hazardous Air Pollutant (HAP) List

Source Category: Boilers (Digester gas fired)

A. Source of information used in the development of reduced HAP list table

The attached target list of 22 HAPs was prepared based on: 1) California experience with toxic air regulations such as AB 2588 and, 2) survey done by EPA and Association of Metropolitan Sewerage Agencies (AMSA). These two approaches are briefly described in the following.

1. In California, the Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588) was implemented on June 1, 1989. This law requires facilities with air toxic emissions to self report emissions in order to determine if "hot spots" exist in the state. Industry groups, public agencies and municipalities were required to submit air emission inventory reports as part of the program. To prepare a report in a cost-effective manner, a combination of methods was used.

To comply with the requirements of AB 2588 at wastewater treatment plants, for instance, the the City of Los Angeles (CLA) acquired consultant services to develop a reduced list of compounds for quantification and reporting purpose. AB 2588 requires quantification of over 150 compounds if they are emitted at a reporting facility in excess of "quantification threshold" in pounds per year. For preparing the reduced or "target list" of +16 compounds for the combustion sources, CLA used historical influent monitoring at the plant, data on VOC found from other Publicly Owned Treatment Works (POTWs), pooled emission estimation program (PEEP), and literature. In addition, ducted headworks were source tested for air and liquid samples collected at the plant influent.

Another source of information used to prepare the reduced HAP list based was based on the data derived from PEEP. PEEP was formed to pool source testing efforts in California as a part of compliance with AB 2588. This program entailed testimg both gas and liquid streams and selected unit processes, developing process emission factors and then applying these factors to other similar processes. Sludge incinerators, headworks and chlorinator discharges were not included in the PEEP program. However, PEEP program recommended a list of 18 compounds for the analysis of exhaust gases from the combustion of the digester gas. The PEEP list differed from the CLA list by only four compounds.

2. The reduced list of HAPs at POTWs was also derived from the report produced by the combined efforts of EPA and AMSA. In April 1995, AMSA provided EPA with a target list of 26 compounds most likely to be found in POTW offgases. AMSA used following methodology of reducing the EPA proposed 108 compounds to 26 compounds based on: 1) compounds sampled for but never detected by POTWs responding to the 1994 National Influent Toxic survey, 2) compounds never samples for by POTWs and, AMSA strongly suspects that they are not present or present in insignificant concentrations and 3) compounds whose mass emission contribution to the total mass emissions from AMSA's model POTW using the 62 compounds detected by POTWs constituted less than one percent.

The AMSA/EPA short list was slightly amended from 26 to 29 by the addition of three compounds based upon EPA's and AMSA's review of Toxic Release Inventory (TRIS) database and AMSA's 1994 national survey.

B. Rationale for the exclusion codes and number of compounds included in the reduced HAP list table

Most industrial dischargers are regulated, and the released compound types and amount can therefore be determined. For POTWs, a reduced list of compounds was necessary considering the diversity of sources contributing wastewater to the facility. For preparation of such a list compounds were excluded based on following three exclusion codes:

1- Compound not expected to be emitted from source because because basic chemical or physical principles do not favor its existence in source exhaust.
2- Existing test data indicate that compound is not emitted in significant quantities from source.
3- Other
4- Compounds not expected to be emitted from POTW sources based on EPA/AMSA (1995) and PEEP (1990) target lists.

Following table summarizes the three reduced HAP lists by CLA, PEEP and AMSA/EPA mentioned above. These lists were used as rationale for preparation of the final reduced HAP list.

Compound List	Source	Comments
16 compounds derived from AB 2588	CLA	For combustion sources
18 compounds derived from AB 2588	PEEP	For combustion (except incinerators) sources
29 compounds derived from CAAA's 189HAP list	AMSA/EPA	For noncombustion sources

Six compounds (1,3-butadiene, 1,4-dioxane, styrene and o-, m-, and p-xylenes) were added to the CLA list of 16 to make the final HAP list of 22 compounds based on their likelihood of existing in most POTW emissions from combustion sources

3. References

a) City of Los Angeles, Department of Public Works, Bureau of Sanitation. (1991) Final Emissions Inventory Report, City of Los Angeles Air Toxics Program, AB 2588 - Air Toxics "Hot Spots" Information and Assessment Act of 1987, Hyperion Treatment Plant, Playa del Rey,

CA.

b) Joint Power Agencies for Pooled Emission Estimation Program. (1990) Final Report for POTWs on Air Toxics "Hot Spots" Information and Assessment Act of 1987.

c) U.S. Environmental Protection Agency, Emission Standards Division, Office of Air Quality and Standards. (June 8, 1995) Presumptive MACT for Publicly Owned Treatment Works (and references therein), Research Triangle Park, NC.

Please contact Farhana Mohamed for more information on the attached list by telephone at (310) 524-9180, FAX at (310) 524-8294 or by e-mail at fym@san.ci.la.ca.us

HAPS Selection and Test Methods for Source Category					
Source Category:		Boilers (digester gas fired)			
Include in List	CAS No.	Chemical name	If excluded, give reason for exclusion (use codes where appropriate)	If Included, give applicable test method(s)	
x	75070	Acetaldehyde		CARB 430	
	60355	Acetamide	2,4		
	75058	Acetonitrile	2,4		
	98862	Acetophenone	2,4		
	53963	2-Acetylaminofluorene	2,4		
x	107028	Acrolein		CARB 430	
	79061	Acrylamide	2,4		
	79107	Acrylic acid	2,4		
	107131	Acrylonitrile	2,4		
	107051	Allyl chloride	2,4		
	92671	4-Aminobiphenyl	2,4		
	62533	Aniline	1,2,4		
	90040	o-Anisidine	1,2,4		
	1332214	Asbestos	1,2,4		
x	71432	Benzene		EPA TO-14/CARB 422	
	92875	Benzidine	2,4		
	98077	Benzotrichloride	2,4		
	100447	Benzyl chloride	2,4		
	92524	Biphenyl	2,4		
	117817	Bis(2-ethylhexyl)phthalat	2,4		
	542881	Bis(chloromethyl)ether	2,4		
	75252	Bromoform	2,4		
x	106990	1,3-Butadiene		EPA TO-14/CARB 422	
	156627	Calcium cyanamide	1,2,4		
	133062	Captan	2,4		
	63252	Carbaryl	2,4		
	75150	Carbon disulfide	2		
x	56235	Carbon tetrachloride		EPA TO-14/CARB 422	
	463581	Carbonyl sulfide	2,4		
	120809	Catechol	2,4		
	133904	Chloramben	2,4		
	57749	Chlordane	2,4		
	7782505	Chlorine	2,4		
	79118	Chloroacetic acid	2,4		
	532274	2-Chloroacetophenone	2,4		
	108907	Chlorobenzene	2,4		
	510156	Chlorobenzilate	1,2,4		
x	67663	Chloroform		EPA TO-14/CARB 422	
	107302	Chloromethyl methyl eth	2,4		
	126998	Chloroprene	2		
	1319773	Cresols/Cresylic acid (iso	2,4		
	95487	o-Cresol	2,4		
	108394	m-Cresol	2,4		
	106445	p-Cresol	2,4		
	98828	Cumene	2		
	94757	2,4-D, salts and esters	2,4		
	3547044	DDE	2,4		
	334883	Diazomethane	2,4		
	132649	Dibenzofurans	2,4		
	96128	1,2-Dibromo3-chloroprop	2,4		
	84742	Dibutylphthalate	2,4		
x	106467	1,4-Dichlorobenzene(p)		EPA TO-14/CARB 422	
x	123911	1,4-Dioxane		EPA TO-14/CARB 422	
	91941	3,3-Dichlorobenzidene	1,2,4		
	111444	Dichloroethyl ether (Bis(2	2,4		
	542756	1,3-Dichloropropene	2,4		
	62737	Dichlorvos	1,2,4		
	111422	Diethanolamine	2,4		
	121697	N,N-Diethyl aniline (N,N-	2,4		
	64675	Diethyl sulfate	2,4		
	119904	3,3-Dimethoxybenzidine	2,4		
	60117	Dimethyl aminoazobenze	2,4		
	119937	3,3--Dimethyl benzidine	2,4		
	79447	Dimethyl carbamoyl chlo	2,4		
	68122	Dimethyl formamide	2,4		
	57147	1,1-Dimethyl hydrazine	2,4		
	131113	Dimethyl phthalate	2,4		
	77781	Dimethyl sulfate	2,4		
	534521	4,6-Dinitroo-cresol, and s	2,4		
	51285	2,4-Dinitrophenol	2,4		
	121142	2,4-Dinitrotoluene	2,4		
	122667	1,2-Diphenylhydrazine	2,4		
	106898	Epichlorohydrin (l-Chloro	2,4		
	106887	1,2-Epoxybutane	2,4		
	140885	Ethyl acrylate	2,4		
	100414	Ethyl benzene	2		
	51796	Ethyl carbamate (Uretha	2,4		
	75003	Ethyl chloride (Chloroeth	2,4		
	106934	Ethylene dibromide (Dibr	2,4		
x	107062	Ethylene dichloride (1,2-		EPA TO-14/CARB 422	

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	107211	Ethylene glycol	2,4		
	151564	Ethylene imine (Aziridine	2,4		
	75218	Ethylene oxide	2,4		
	96457	Ethylene thiourea	2,4		
	75343	Ethylidene dichloride (1,	2,4		
x	50000	Formaldehyde		CARB 430	
	76448	Heptachlor	2,4		
	118741	Hexachlorobenzene	2,4		
	87683	Hexachlorobutadiene	2,4		
	77474	Hexachlorocyclopentadie	2,4		
	67721	Hexachloroethane	2,4		
	822060	Hexamethylene-1,6-diisc	2,4		
	680319	Hexamethylphosphoram	2,4		
	110543	Hexane	2,4		
	302012	Hydrazine	2,4		
	7647010	Hydrochloric acid	2,4		
	7664393	Hydrogen fluoride (Hydro	2,4		
	7783064	Hydrogen sulfide	2,4		
	123319	Hydroquinone	2,4		
	78591	Isophorone	2,4		
	58899	Lindane (all isomers)	2,4		
	108316	Maleic anhydride	2,4		
	67561	Methanol	2,4		
	72435	Methoxychlor	2,4		
	74839	Methyl bromide (Bromon	2,4		
	74873	Methyl chloride (Chlorom	2		
x	71556	Methyl chloroform (1,1,1-	Trichloroethane)	EPA TO-14/CARB 422	
	78933	Methyl ethyl ketone (2-B	2		
	60344	Methyl hydrazine	2,4		
	74884	Methyl iodide (Iodometha	2		
	108101	Methyl isobutyl ketone (H	2		
	624839	Methyl isocyanate	2,4		
	80626	Methyl methacrylate	2,4		
	1634044	Methyl tert butyl ether	2		
	101144	4,4-Methylene bis(2-chlo	2,4		
x	75092	Methylene chloride (Dich	loromethane)	EPA TO-14/CARB 422	
	101688	Methylene diphenyl diiso	2,4		
	101779	4,4--Methylenedianiline	2,4		
	91203	Naphthalene	2,4		
	98953	Nitrobenzene	2,4		
	92933	4-Nitrobiphenyl	2,4		
	100027	4-Nitrophenol	2,4		
	79469	2-Nitropropane	2,4		
	684935	N-Nitroso-Nmethylurea	2,4		
	62759	N-Nitrosodimethylamine	2,4		
	59892	N-Nitrosomorpholine	2,4		
	56382	Parathion	1,2,4		
	82688	Pentachloronitrobenzene	1,2,4		
	87865	Pentachlorophenol	2,4		
	108952	Phenol	2,4		
	106503	p-Phenylenediamine	2,4		
	75445	Phosgene	2,4		
	7803512	Phosphine	2,4		
	7723140	Phosphorus	2,4		
	85449	Phthalic anhydride	2,4		
	1336363	Polychlorinated biphenyl	2,4		
	1120714	1,3-Propane sultone	2,4		
	57578	beta-Propiolactone	2,4		
	123386	Propionaldehyde	2,4		
	114261	Propoxur (Baygon)	1,2,4		
	78875	Propylene dichloride (1,2	2,4		
	75569	Propylene oxide	2,4		
	75558	1,2-Propylenimine (2-Me	2,4		
	91225	Quinoline	2,4		
	106514	Quinone	2,4		
	96093	Styrene oxide	2,4		
	1746016	2,3,7,8-Tetrachlorodiben	1,2,4		
x	127184	Tetrachloroethylene (Per	2,4	EPA TO-14/CARB 422	
	7550450	Titanium tetrachloride	1,2,4		
x	100425	Styrene		EPA TO-14/CARB 422	
x	108883	Toluene		EPA TO-14/CARB 422	
	95807	2,4-Toluene diamine	2,4		
	584849	2,4-Toluene diisocyanate	2,4		
	95534	o-Toluidine	2,4		
	8001352	Toxaphene (chlorinated	2,4		
	120821	1,2,4-Trichlorobenzene	2		
	79005	1,1,2-Trichloroethane	2,4		
x	79016	Trichloroethylene		EPA TO-14/CARB 422	
	95954	2,4,5-Trichlorophenol	2,4		
	88062	2,4,6-Trichlorophenol	2,4		

HAPS Selection and Test Methods for Source Category					
Source Category:		Boilers (digester gas fired)			
Include in List	CAS No.	Chemical name	If excluded, give reason for exclusion (use codes where appropriate)	If Included, give applicable test method(s)	
	121448	Triethylamine	2,4		
	1582098	Trifluralin	1,2,4		
	540841	2,2,4-Trimethylpentane	2,4		
	108054	Vinyl acetate	2		
	593602	Vinyl bromide	2,4		
x	75014	Vinyl chloride		EPA TO-14/CARB 422	
x	75354	Vinylidene chloride (1,1-e		EPA TO-14/CARB 422	
x	1330207	Xylenes (isomers and mixture		EPA TO-14/CARB 422	
x	95476	o-Xylenes		EPA TO-14/CARB 422	
x	108383	m-Xylenes		EPA TO-14/CARB 422	
x	106423	p-Xylenes		EPA TO-14/CARB 422	
	N/A	Antimony Compounds	1,2,4		
	N/A	Arsenic Compounds (inc	1,2,4		
	N/A	Beryllium Compounds	1,2,4		
	N/A	Cadmium Compounds	1,2,4		
	N/A	Chromium Compounds	1,2,4		
	N/A	Cobalt Compounds	1,2,4		
	N/A	Coke Oven Emissions	1,2,4		
	N/A	Cyanide Compounds *1	1,2,4		
	N/A	Glycol ethers *2	1,2,4		
	N/A	Lead Compounds	1,2,4		
	N/A	Manganese Compounds	1,2,4		
	N/A	Mercury Compounds	1,2,4		
	N/A	Fine mineral fibers *3	2,4		
	N/A	Nickel Compounds	1,2,4		
	N/A	Polycylic Organic Matter	2,4		
	N/A	Radionuclides (including	1,2,4		
	N/A	Selenium Compounds	1,2,4		